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Complies with ASME Standard B31.3*



NUFLO™

EZ-IN® Series Turbine Flowmeter Installation Manual

Part No. 9A-100062997, Rev. 01



Measurement Systems

EZ-IN® Series BF Turbine Flowmeter Manual

Part No. 9A-100062997, Rev. 01

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Introduction

The EZ-IN® Series Between-Flange Turbine Flowmeter measures flowstream volume in flanged pipelines by transmitting electrical pulses to readout instruments.

The flowmeter's precision turbine has a rotational velocity proportional to the linear velocity of the fluid flowing through the meter. As the turbine rotates, the blades break magnetic lines of force set up by a magnetic pickup screwed into the meter body. This penetration of the magnetic field creates electrical pulses.

Internal components vary, depending on the size of the end connection. The hex-body flowmeter shown in Figure 1, page 6, is designed with a 1-in. end connection. The round-body flowmeter shown in Figure 2, page 7, is designed with a 2-in. or larger end connection.

For installation, ANSI raised face or ring joint flanges and gaskets are recommended as well as all-thread studs and nuts. Body centering rings and flow straighteners can also be used.

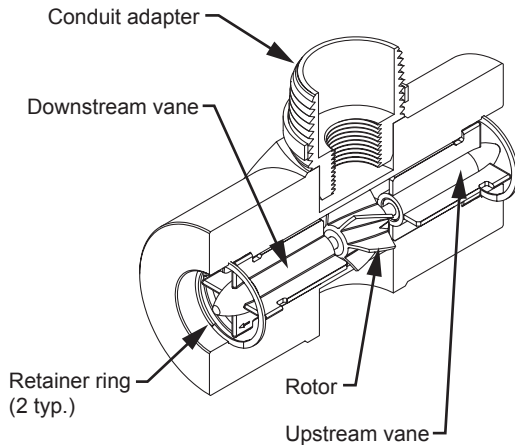


Figure 1—Internal components for hex-body flowmeters (1-in. end connection)

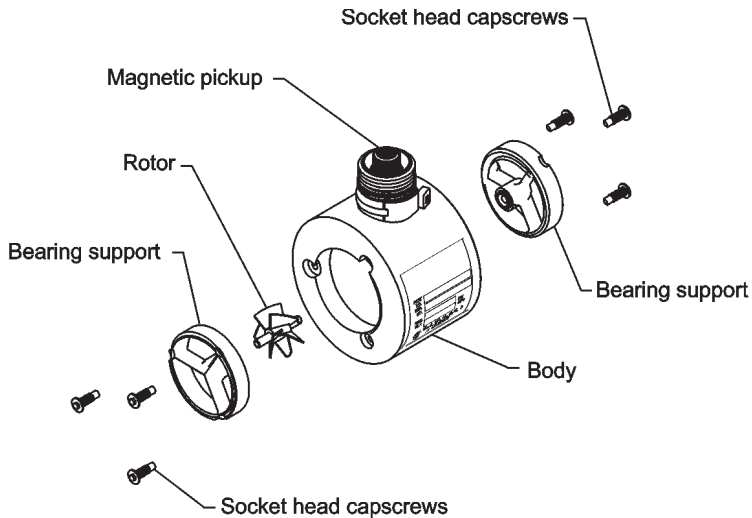


Figure 2—Internal components for round-body flowmeters (2-in. or larger end connection)

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An installation handle (Figure 3) is available to allow easier installation and removal (Part No. 9A-100079570). An optional 3/4-in. thin-wall pickup lock-nut socket is also available (Part No. 9A-100013146).

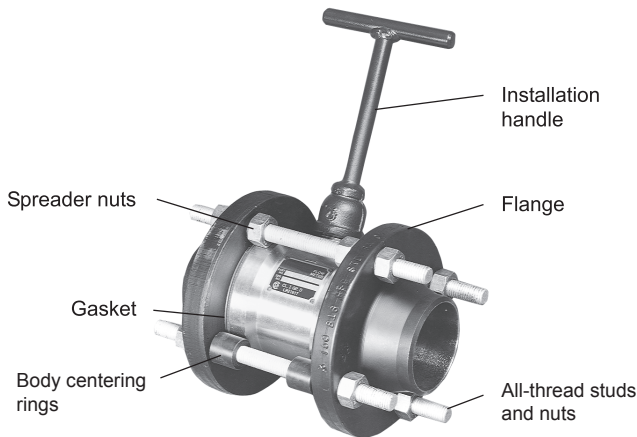


Figure 3—Assembled flowmeter with optional installation handle

Flowmeter identification data and specifications are engraved on the flowmeter body or printed on a stainless steel tag, which is attached to the meter body (Figure 4).

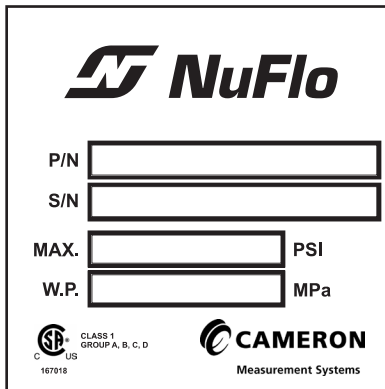


Figure 4—Product identification tag on flowmeter body

Installation

Precautions

The EZ-IN® Series Between-Flange Turbine Flowmeter can be installed vertically or horizontally. In either orientation, the arrow on the meter body must point in the direction of flow in the line.

- Before installing the meter, clean all upstream lines.
- Do not blow out lines with compressed air or gas once the meter has been installed.
- Do not slug the meter with fluid. Carefully fill the line after installing the meter. After startup, keep the meter full of fluid.
- Never exceed the minimum or maximum recommended pressure and temperature limits. See Temperature and Pressure Ratings, page 25.
- Never exceed the maximum recommended flow rate for the meter. See Flow Ranges, page 25.
- Avoid hammer blows or other sharp impacts to the meter that could damage internal parts.

- If the end connection leaks at the time of installation, remove pressure-before attempting to tighten the seal.
- The customer is responsible for ensuring chemical compatibility between the flowmeter and any fluids being metered.
- The meter will attain the temperature of the fluid. Use caution when touching the meter body to avoid burns.
- Use appropriate bolts and hardware per ANSI B16.5 and, if applicable, NACE MRO175 / ISO 15156.

Installation Procedure

1. Install a straight section of pipe on either side of the meter. This pipe must be the same size as the meter end connection with a minimum length of 10 pipe diameters upstream and 5 pipe diameters downstream. For example, a flowmeter with a 6-in. end connection requires 6-in. pipe. The section of pipe upstream must be 60 in.; the section downstream must be 30 in.
2. To create a cradle for the meter, assemble all-thread studs, nuts, (centering rings, if purchased), and gaskets to connect the flanges using only

the holes in the bottom half of the flanges (Figure 5, page 13). Install additional nuts inside the flanges, if needed, to separate the flanges while inserting the meter. (See “spreader” nuts in Figure 3, page 8.)

2. Lower the meter between the flanges and align the bore with the flowline. If centering rings are installed, the meter will rest on them.
3. Install the remainder of the all-thread studs and nuts through the holes in the top half of the flanges.
4. Tighten the nuts.
5. Insert the magnetic pickup assembly into the flowmeter and turn it until it is hand-tight, then back it out $\frac{1}{4}$ turn. Tighten the lock nut to prevent the pickup from vibrating.

Calibration

The EZ-IN® Series flowmeter is precalibrated with water at the factory and tagged with the calibration factor in pulses per gallon. For maximum accuracy with fluids other than water, calibrate the meter with the desired fluid in the flowline. This meter can be calibrated using any conventional turbine meter calibration method.

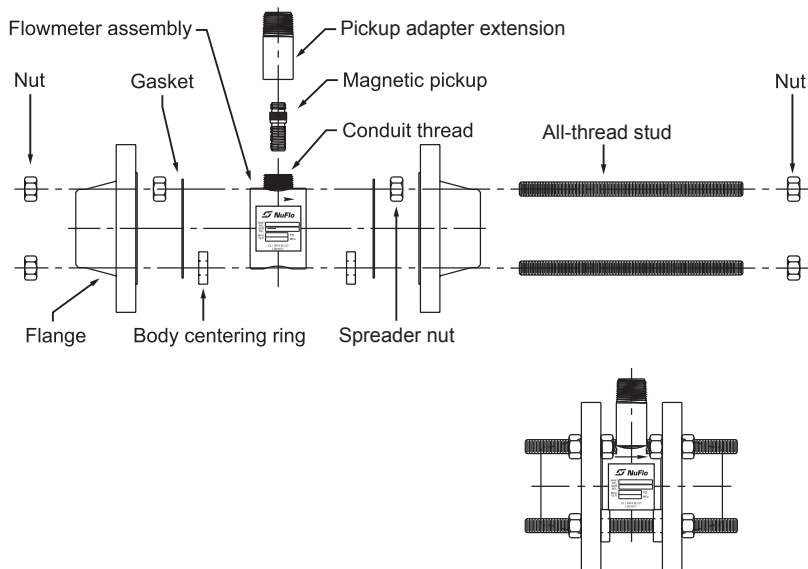


Figure 5—Meter installation diagram

Maintenance and Repairs

If flowmeter readings appear erratic, check the flowmeter for wear or debris. Under normal operation with non-abrasive fluids, flowmeters can provide years of service without repairs. If a flowmeter is exposed to abrasive fluids or long periods of over-range flow rates, an annual check is recommended.

Removing the Meter from the Pipeline

1. Remove all pressure from the line.
2. Remove the magnetic pickup (Figure 5, Page 13) to avoid damaging it.
3. Remove one or more of the flange bolts.
4. Loosen the remaining flange bolt nuts to allow clearance for the meter.
If additional “spreader” nuts were installed, tighten them to help free the meter.
5. Lift the meter from between the pipeline flanges, using an installation handle if necessary (Figure 3, page 8).

Disassembling the Hex-Body Meter

Assembly and disassembly procedures vary with the type of flowmeter installed. For instructions on repairing a round-body meter, see page 19.

To disassemble a hex-body meter, follow the steps below.

1. Remove the retaining ring from one end of the meter body.
2. Remove the vane from the meter body. Some slotted meters may require a slight twist of the vane to align the vane with the slot in the meter body. (If the vane is stuck, insert a brass rod through the opposite vane and the rotor and tap on alternate blades of the vane to loosen.)
3. Remove the rotor. Handle with care to prevent damage to the shaft.
4. Remove the retaining ring from the other end of the meter body.
5. Remove the second vane from the meter body.
6. Examine the carbide bearing and rotor shaft. If either part is worn or damaged, replace all internals with a repair kit (page 27).

Reassembling the Hex-Body Meter

- An arrow indicating direction of flow is cast or engraved on the meter body, rotor, and vanes. When the meter is assembled, all arrows must point in the direction that product will flow through the meter.
- Vanes are designed to fit into four notches inside the meter body. During assembly, both vanes must be positioned such that the vane blade marked with a flow arrow is closest to the bottom of the bore (assuming that the conduit adapter is at the top of the meter).
- Never use force when assembling meter components. The tungsten carbide rotor shaft is brittle and can break under excessive force.

To reassemble a hex-body meter, follow the steps below:

1. Insert a vane into the meter body, ensuring that the flow arrow is pointing in the direction of flow and the marked blade is positioned at the bottom of the bore (Figure 6, page 18). The vane should fit snugly but should not require excessive force to install.
2. Insert a retainer ring behind the vane.
3. Insert the rotor into the opposite end of the meter body, ensuring that the flow arrow is pointing in the direction of flow. Handle the rotor with care to avoid chipping the rotor shaft.
4. Insert the second vane into the meter body, ensuring that the marked blade is positioned at the bottom of the bore. Rotate the rotor if necessary to allow the vane to slip into position. Do not use force to drive the vane into the meter body, as this can result in a broken rotor shaft.
5. Insert a retainer ring behind the vane.
6. Spin the rotor by hand. If the rotor does not turn freely or stops abruptly, disassemble the meter and check the rotor for damage.

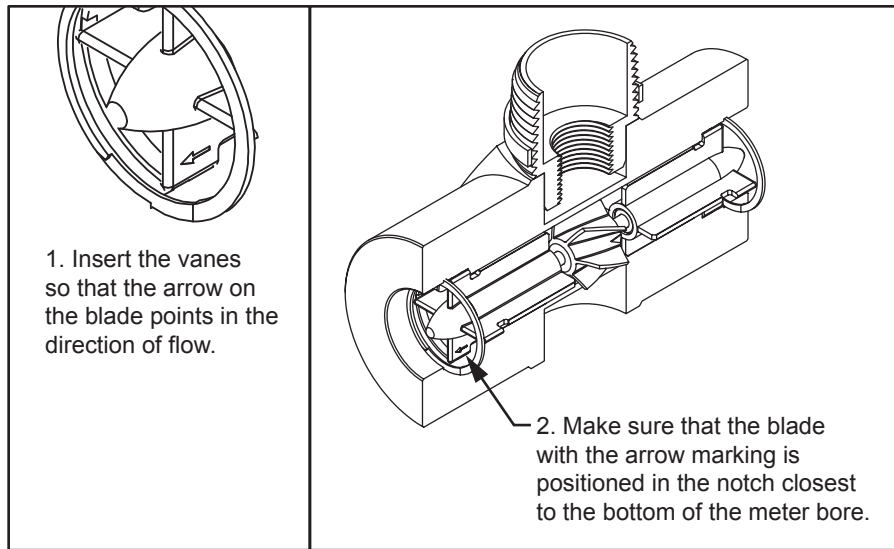


Figure 6—Positioning of vanes

Disassembling the Round-Body Meter

Assembly and disassembly procedures vary with the type of flowmeter installed. For instructions on repairing a hex-body meter, see page 15.

To disassemble a round-body meter, follow the steps below:

1. Remove the three socket-head capscrews from one end of the meter using a standard Allen wrench.
2. Pull the bearing support straight from the meter body, rotating it if necessary.

Caution—Do not pry on the bearing supports. Internal components could break or shatter. If a bearing support is stuck, soak the meter in solvent or insert a wooden dowel or brass rod from the other end of the meter and gently tap on the support to free it.

3. Remove the rotor. Handle with care to prevent damage to the shaft.

4. Remove the three socket-head capscrews from the other end of the meter body.
5. Remove the second bearing support, rotating it if necessary.
6. Examine the carbide bearing and rotor shaft. If either part is worn or damaged, replace all internals with a repair kit (page 28).

Reassembling the Round-Body Meter

- An arrow indicating direction of flow is cast or engraved on the meter body, rotor, and bearing supports. When the meter is assembled, all arrows must point in the direction that product will flow through the meter.
- During calibration, punch marks are placed on the meter body and the bearing supports to mark the positions of the bearing supports. During assembly, the punch marks must be realigned for maximum accuracy.
- Never use force when assembling meter components. The tungsten carbide rotor shaft is brittle and can break under excessive force.

To reassemble a round-body meter, follow the steps below:

1. Insert a bearing support in the meter body, ensuring that the flow arrow is pointing in the direction of flow and the punch marks on the support and meter body are aligned (Figure 7, page 22).
2. Install the three socket-head capscrews to secure the bearing support, and tighten them with a standard Allen wrench.
3. Insert the rotor into the opposite end of the meter body, ensuring that the flow arrow is pointing in the direction of flow. Handle the rotor with care to avoid chipping the rotor shaft.
4. Insert the the second bearing support into the meter body, aligning punch marks as described in step 1.
5. Install the three socket-head capscrews to secure the bearing support, and tighten them with a standard Allen wrench.
6. Spin the rotor by hand. If the rotor does not turn feely or stops abruptly, disassemble the meter and check the rotor for damage.

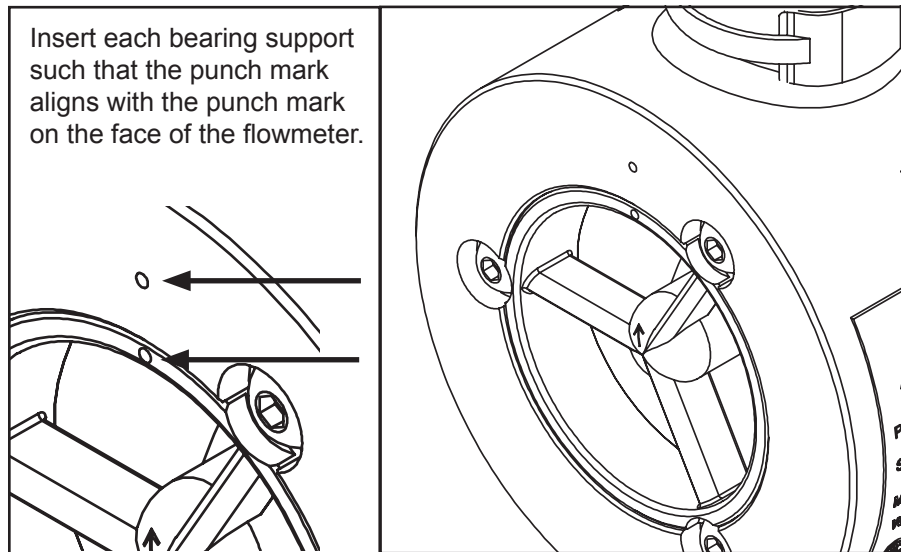


Figure 7—Positioning of bearing supports

Returning the Meter to the Pipeline

1. Return the meter to the line, using the body centering rings (Figure 3, page 8) to align the meter with the inside diameter of the flanges. Carefully align the flange gaskets with the flanges to help prevent gasket damage. Use the spreader nuts, if necessary, to position the meter between the flange gaskets.
2. Reinstall the bolts that were removed from the flanges when the meter was taken out of the line.
3. Loosen the flange spreader nuts until they no longer are engaged.
4. Tighten the nuts on the flange bolts until they form a seal on the flange gasket.
5. Fill the meter with fluid, following the precautions on pages 10 and 11.

Specifications and Parts Lists

Temperature and Pressure Ratings

Flange Classification	CL 150	CL 300	CL 600	CL 900	CL 1500	CL 2500
Design-Operating Temperature Range	Maximum Working Pressure psi (mPa)					
-20 to 100°F	285	740	1480	2220	3705	6170
(-28.8 to 37.7°C)	(1.96)	(5.1)	(10.2)	(15.3)	(25.5)	(42.5)
200°F	260	680	1360	2035	3395	5625
(93.3°C)	(1.79)	(4.7)	(9.38)	(14.03)	(23.4)	(38.8)
400°F	200	635	1265	1900	3170	5280
(204.4°C)	(1.38)	(4.38)	(8.72)	(13.1)	(21.8)	(36.4)
450°F	185	620	1235	1855	3092	5152
(232°C)	(1.28)	(4.27)	(8.5)	(12.79)	(21.32)	(35.52)

Flow Ranges

Meter Bore Size in.	Linear Flow Ranges (based on water) ^a			Nominal Calibration Factor pulses/gal (pulses × 1000/m ³)	Max. Output Frequency pulses/sec	Δp at Max. Flow psi (kPa)
	gal/min	m ³ /h	B/D			
3/8	0.46 to 3	0.104 to 0.68	10 to 100	22,000 (5812)	1,100	4 (28)
1/2	0.80 to 7.5	0.182 to 1.70	25 to 250	14,500 (3830)	1,815	12 (83)
3/4	2 to 15	0.45 to 3.41	68 to 515	2,950 (780)	740	18 (124)
7/8	3 to 30	0.68 to 6.81	100 to 1,000	2,350 (621)	1,175	20 (138)
1	5 to 50	1.14 to 11.36	170 to 1,700	900 (238)	750	20 (138)
1 1/2	15 to 180	3.41 to 40.88	515 to 6,000	325 (86)	975	16 (110)
2	40 to 400	9.09 to 90.85	1,300 to 13,000	55 (14.5)	365	22 (152)
3	80 to 800	18.17 to 181.7	2,750 to 27,500	57 (15.2)	760	16 (110.4)
4	100 to 1,200	22.71 to 272.55	3,400 to 41,000	30 (7.9)	600	10 (69)
6	250 to 2,500	56.78 to 567.82	8,600 to 86,000	7 (1.8)	290	10 (69)
8	350 to 3,500	79.49 to 794.94	12,000 to 120,000	3 (0.8)	175	6 (41)

^a The linear flow range of liquids with non-lubricating characteristics is limited to the upper 60% of rating.

Internal Components Repair Kit for Hex-Body Meters

Meter Bore Size in.	End Connection Size in.	Standard Grade Linearity $\pm 1.0\%$	Industrial Grade Linearity $\pm 0.5\%$
3/8	1	9A-100003521 ^a	9A-100003378 ^b
1/2	1	9A-100003531	9A-100003379
3/4	1	9A-100003449	9A-100003380
7/8	1	9A-100005124	9A-100061059
1	1	9A-100003527	9A-100003381

^a Linearity for a 3/8-in. bore x 1-in. end connection, standard grade is $\pm 2.0\%$.

^b Linearity for a 3/8-in. bore x 1-in. end connection, industrial grade is $\pm 1.0\%$.

Kit includes 1 rotor, 2 vane assemblies, 2 retainer rings, and a calibration tag.

Repair kits shown are suitable for temperatures of -20 to 250°F (-28.8 to 121.1°C). If operating temperatures are likely to exceed this range, contact factory for the appropriate repair kit part number.

Internal Components Repair Kit for Round-Body Meters

Meter Bore Size in.	End Connection Size in.	Standard Grade Linearity $\pm 1.0\%$	Industrial Grade Linearity $\pm 0.5\%$
3/8	2	9A-100079691	—
1/2	2	9A-100005122	9A-100062982
3/4	2	9A-100079674	9A-100062983
7/8	2	9A-100079811	9A-101209539
1	2	9A-100005123	9A-100062984
1 1/2	2	9A-100005099	9A-100062985
2	2	9A-100003553	9A-100003549
3	3	9A-100003540	9A-100012104
4	4	9A-100003554	9A-100062986
6	6	9A-100012091	9A-100062987
8	8	9A-100063004	9A-100062988

Kit includes 1 rotor, 2 bearing supports, six socket-head screws, and a calibration tag.

Repair kits shown are suitable for temperatures of -20 to 250°F (-28.8 to 121.1°C). If operating temperatures are likely to exceed this range, contact factory for the appropriate repair kit part number.

**Retainer Rings for Hex-Body Meters
(Purchased Separately from Repair Kit)**

Meter Bore Size in.	End Connection Size in.	Retainer Ring Part Number
3/8	1	9A-100003414
1/2		
3/4		
7/8	1	9A-100003415
1		

Hardware Kits and Centering Rings (Raised Face Flanges)

Hardware Kits ^a					
Size (in.)	CL 150	CL 300	CL 600	CL 900	CL 1500
1	9A-100014135	9A-100009578	9A-100009578	9A-100079754	9A-100079754
1 1/2 and 2	9A-100003555	9A-100003556	9A-100003556	9A-100003557	9A-100003557
3	9A-100003558	9A-100007860	9A-100007860	9A-100003559	9A-100012105
4	9A-100003560	9A-100003561	9A-100003562	9A-100063005	9A-100063006
6	9A-100063007	9A-100063008	9A-100012106	9A-100063009	9A-100063010
8	9A-100063011	9A-100063012	9A-100063013	9A-101209537	9A-101209536

^a Includes studs, nuts, gaskets, spreader nuts, a pickup adapter extension, and centering rings.
(Kit does not include flanges.)

Centering Rings Only ^b					
Size (in.)	CL 150	CL 300	CL 600	CL 900	CL 1500
1	9A-100079753	9A-100079752	9A-100079752	9A-100079751	9A-100079751
1 1/2 and 2	9A-100007974	9A-100007973	9A-100007973	9A-100014124	9A-100014124
3	9A-100079569	9A-100014122	9A-100014122	9A-100079568	9A-100014120
4	9A-100014123	9A-100014122	9A-100014121	9A-100014120	9A-100079567
6	9A-100079566	9A-100079565	9A-100079564	9A-100079563	9A-100079562
8	9A-100079561	9A-100079560	9A-100079559	9A-101209538	9A-100079558

^b Four centering rings are required for installation.

Hardware Kits (Ring Joint Flanges)

Size (in.)	CL 900	CL 1500	CL 2500
1 1/2 and 2	9A-100014145	9A-100014145	9A-100080024
3	9A-101213513	9A-100079971	9A-101203294
4	9A-100079986	9A-100079960	9A-101209541
6	9A-100080034	9A-100080023	N/A
8	9A-101215223	N/A	N/A

^a Hardware kit includes studs, nuts, seal rings, spreader nuts, and a pickup adapter extension. (Kit does not include flanges).

Magnetic Pickups and Replacement Lock Nuts

Meter Bore Size	Temperature Range (°F)	Magnetic Pickup Part No.
3/8 through 3/4 in. ^a	-67 to 225	9A-100002337
7/8 through 8 in. ^a	-67 to 250	9A-100002077
3/8 through 8 in. ^a	-67 to 450	9A-100002076
Replacement lock nut		9A-100028944

^a Each magnetic pickup is shipped with a lock nut.

Warranty—Limitation of Liability

WARRANTY - LIMITATION OF LIABILITY: Seller warrants only title to the products, software, supplies and materials and that, except as to software, the same are free from defects in workmanship and materials for a period of one (1) year from the date of delivery. Seller does not warranty that software is free from error or that software will run in an uninterrupted fashion. Seller provides all software "as is". THERE ARE NO WARRANTIES, EXPRESS OR IMPLIED, OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR OTHERWISE WHICH EXTEND BEYOND THOSE STATED IN THE IMMEDIATELY PRECEDING SENTENCE. Seller's liability and Buyer's exclusive remedy in any case of action (whether in contract, tort, breach of warranty or otherwise) arising out of the sale or use of any products, software, supplies, or materials is expressly limited to the replacement of such products, software, supplies, or materials on their return to Seller or, at Seller's option, to the allowance to the customer of credit for the cost of such items. In no event shall Seller be liable for special, incidental, indirect, punitive or consequential damages. Seller does not warrant in any way products, software, supplies and materials not manufactured by Seller, and such will be sold only with the warranties that are given by the manufacturer thereof. Seller will pass only through to its purchaser of such items the warranty granted to it by the manufacturer.

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